# APPENDIX A

# QUALITY ASSURANCE PROJECT PLAN

# FOR THE

# NON-TIME CRITICAL REMOVAL SUPPORT WORK PLAN

## TRONOX NAVAJO AREA URANIUM MINES
## SECTIONS 35/36 (CLIFFSIDE) MINES
## HIGHWAY 509
## MCKINLEY COUNTY, NEW MEXICO

Prepared for

**U.S. Environmental Protection Agency Region 6**
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Contract No. EP-W-06-042
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EPA TOM: Warren Zehner/Jon Rinehart
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# A PROJECT MANAGEMENT

Weston Solutions, Inc. (WESTON®), the Superfund Technical Assessment and Response Team (START-3) contractor, has been tasked by the U.S. Environmental Protection Agency (EPA) Region 6 under Contract No. EP-W-06-042, Task Order (TO) Number 0041 (Appendix A) to conduct a Removal Site Assessment (RSA) and an Engineering Evaluation/Cost Analysis (EE/CA) as part of Non-Time-Critical Removal Support (NTCRS) at the Sections 35/36 (Cliffside) Mines (Site) located in McKinley County, New Mexico. The Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) number assigned to the Site is NMN000607481. As part of the EE/CA, START-3 has prepared this Quality Assurance Project Plan (QAPP) to describe procedures that will be used to collect samples and generate analytical data to support the EE/CA.

START-3 is responsible for the oversight and ultimate implementation of this QAPP. START-3 and any other contractors involved in the implementation of this QAPP will furnish the personnel, materials, equipment, services, and facilities necessary to perform the NTCRS activities. The oversight agency for these tasks is EPA Region 6.

## A1 PROJECT/TASK ORGANIZATION

START-3 will provide a team of fully trained personnel, including the multidisciplinary technical staff that shall provide the knowledge and expertise necessary to complete the required tasks. Additionally, START-3 will provide a management structure that supports and compliments the technical team. START-3 will utilize a field laboratory located in the project field office, as well as an off-site commercial laboratory for laboratory analysis.

### A1.1 Purpose and Background

This QAPP is based on the most recent EPA model QAPP format, *EPA Requirement for Quality Assurance Project Plan, EPA QA/R-5*, (EPA, 2001), and presents current EPA methods for analysis based on the *CLP Statement of Work (SOW) for Multi-Media, Multi-Concentration Organics Analysis (SOM01.2)* (EPA, 5 October 2006, Updated 12 February 2007, amended 11

April 2007) and *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods* (SW-846) Final Update IV, 3 January 2009.

## A1.2 Roles and Responsibilities

The project organization provides an understanding of the roles and responsibilities that each party assumes during the RSA portion of this project. START-3 shall provide an independent chain-of-command to the Quality Assurance Officer to ensure that proper checks and balances are maintained during the execution of this project. Any individual assigned to a quality assurance/quality control (QA/QC) responsibility has this independent line of communication available to him/her. Project QA/QC personnel have the authority to stop work if the QAPP requirements are not met.

Table A-1 depicts the associated personnel responsibility matrix. The QA/QC roles and responsibilities of key project personnel are described in the following sections.

### A1.2.1 Project Manager

The Project Manager, David Bordelon, ensures the overall management and quality of work performed under this project. Mr. Bordelon shall assure that all project goals and objectives are achieved in a high quality and timely manner. All QA/QC and nonconformance issues shall be addressed by Mr. Bordelon in coordination with the Project Team Leader and the Quality Assurance Officer for corrective action.

### A1.2.2 Project Team Leader

The Project Team Leader, Robert Sherman, is responsible for planning, implementing, monitoring, and controlling all work. The Project Team Leader is the single point of contact for coordination with the EPA and shall have, as a minimum, the following responsibilities:

- Maintain close communication and coordination with the EPA Task Order Manager (TOM), including reporting any and all problems encountered in conducting tasks associated with the project.
- Provide personnel, equipment, and materials necessary to complete the project.
- Provide direction for field activities to measure gamma radiation.

- Implement document control and chain-of-custody (COC) procedures utilizing SCRIBE and Response Manager modules
- Implement the site-specific health and safety plans and provide site safety supervision for all on-site personnel, including subcontractor employees, if utilized.
- Take immediate corrective action when performance is not acceptable.
- Implement and manage the elements of this QAPP. Ensure that the performance of assigned tasks adheres to all QA, QC, and COC procedures specified in the QA program and project plans.

### A1.2.3 Quality Assurance Officer

The Quality Assurance Officer (QAO), Ms. Jan Cristner, P.E., is responsible for implementing project quality procedures for all site activities. Ms. Cristner has the following responsibilities:

- Participate in field project activity readiness reviews and inspections.
- Approve fieldwork variances before work continues.
- Perform audits as requested.
- Review and approve all nonconformance reports and corrective action reports.
- Approve and maintain the approved QAPP.

### A1.2.4 Project Health Physicist

The Project Health Physicist, Bob Schoenfelder, shall ensure that all data generated are of known quality sufficient to support the intended decisions and that the quality of the data is communicated to the project decision-makers. Mr. Schoenfelder's responsibilities include:

- Develop and implement the QAPP.
- Maintain close communication with the EPA TOM.
- Serve as the laboratory point of contact.
- Establish and monitor compliance with project Data Quality Objectives (DQOs).
- Review analytical data for compliance with project Data Quality Indicators.
- Notify the Project Team Leader and QAO of any data deficiencies and initiate any applicable nonconformance reports.
- Conduct audits of laboratory procedures as appropriate.

### A1.2.5 Project Chemist

The Project Chemist, Jeff Wright, shall manage the laboratory procurement and analytical data. Mr. Wright's responsibilities include:

- Implement QAPP requirements.
- Interface with the Project Health Physicist to verify that QA procedures are implemented.
- Verify that field laboratory procedures meet project QA requirements.
- Notify the Project Health Physicist and QAO of any data deficiencies and initiate any applicable non conformance reports.

### A1.2.6 Problem Definition/Background

The following subsections discuss the site history and background information for the current project.

## A1.3 Definition of Problem

The Section 35 Mine and the Section 36 (Cliffside) Mine operated in the Ambrosia Lake Subdistrict of the Grants Mining District from 1960-1985. The mines were "wet mines", while operational, and each mine had an average mine water discharge rate of over 1,000 gallons per minute. This water was largely untreated and discharged to the surface water drainage features. Additionally, contaminated soil and other materials were deposited on the surface due to mining practices of the period. These historical underground mining operations contributed waste (uranium and other radionuclides) to the ground surface in the areas surrounding the Section 35 and 36 Mines.

## A1.4 Background

Site-specific background information can be found in the Sampling and Analysis Plan (SAP).

# A2 PROJECT/TASK DESCRIPTION

START-3 is providing technical support to EPA Region 6 for the RSA and EE/CA. The objectives of the project are to investigate the nature and extent of site-related radiological contamination associated with the Sections 35 and 36 (Cliffside) mine sites, and to develop and

evaluate the potential remedial alternatives for the site in accordance with Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), and with the National Oil and Hazardous Substances Pollution Contingency Plan [National Contingency Plan (NCP)].

This project RSA and EE/CA are designed to assess the nature and extent of contamination in soil near and down gradient of the Sections 35 and 36 (Cliffside) mines. Gamma scanning will be conducted and soil samples will be collected from the mine sites and down-gradient areas. The data will be used to develop and evaluate potential remedial alternatives for the site. Field tasks, sampling methods, maps, and plans are presented in detail in the Sampling and Analysis Plan (SAP).

### A2.1 Schedule

Field activities will commence on 13 July, 2015. An estimated schedule of major work breakdown structure (WBS) elements is provided as table 5-2 in the Task Order 0041 Work Plan.

### A2.2 Site Specific Action Levels

The action level for the site is an exposure of 12 millirems per year (mrem/yr). START-3 will use EPA's Preliminary Remediation Goals (PRG) Calculator software to develop a site-specific Derived Concentration Guideline Level (DCGL). Explanations of this derivation are provided in the QASP.

## A3 QUALITY OBJECTIVES AND CRITERIA

The quality objectives for this project are to collect samples and field information that are technically sound and properly documented, and to validate and report data that are statistically valid and of known precision and accuracy.

The DQO process is a systematic approach for defining the criteria that the data collection design should satisfy. The DQO process was developed using the seven-step process set out in the *Guidance for the Data Quality Objective Process*, EPA QA/R5. The DQOs for this project are presented in Table A-2.

## A4 SPECIAL TRAINING AND CERTIFICATION

START-3 personnel are provided with training that ensures that technical, operational, and quality requirements are understood and met. In addition, a vigorous ongoing professional development program is maintained to strengthen staff skills, to provide career development, and to maintain staff retention. START-3 project staff receives training that includes, but is not limited, to the following:

- Logbook Training - Logbook training for the maintenance of field equipment and personal logbooks is presented to all employees upon initial employment and as refresher training to ensure accurate and appropriate project documentation.
- Health and Safety Training - Health and safety training will be provided to ensure compliance with Occupational Safety and Health Administration (OSHA), as established in 29 CFR 1910.120. This training includes, but is not limited to, 40-hour OSHA HAZWOPER training for new employees, 8-hour annual refresher OSHA training, 8-hour supervisor training, cardiopulmonary resuscitation (CPR), first aid training, blood-borne pathogens training, and hazardous materials shipping training.
- Certifications - Team members are encouraged to attain and maintain certifications required for conducting work within the START-3 Scope of Work (SOW).
- Radiation Training – Team members will be given specific training on ionizing radiation, radiation safety, and the use of radiation field instruments.
- Conflict of Interest, Ethics, and Confidential Business Information Training – Team members will participate in refresher training on reporting conflicts of interest and maintaining confidentiality of project information.

All certificates and/or documentation that record completion of training will be maintained in START-3 personnel files.

## A5 DOCUMENTATION AND RECORDS

It is the responsibility of the START-3 QAO to ensure the appropriate project personnel have the most current version of the QAPP, including all updates. As updates are made, the appropriate number of controlled copies will be distributed to the persons listed on the Distribution List who will in turn distribute copies to the appropriate field personnel.

Overall project records will include the following: the Project QAPP, Standard Operating Procedures (SOPs), and distribution lists for these documents; and copies of general in-house records [such as any site-specific instrument calibration and preventive maintenance logs,

performance evaluation results (if any); audit reports; and purchasing records and documentation]. The project team will also organize project-specific records in the site file, and maintain these as per START-3 management system which is designed to collect, maintain, and retrieve records. Project data and information will be tracked and managed from inception to the final storage area.

The following documents provide the START-3 project team with directions for implementing and fulfilling QA requirements for this project, and are incorporated by reference as part of this QAPP:

- Quality Assurance Management Plan (QMP) — The START-3 Contract No. EP-W-o6-042 QMP provides overall corporate policy statements, procedures, and responsibilities to implement quality throughout the corporation.
- Compendium of Environmental Response Team (ERT) Standard Operating Procedures — SOPs provide a uniform approach to sampling, equipment use, and analytical procedures that will be consistently employed by START-3 personnel.

Documents and records related to field operations that will be managed include but are not limited to the following:

- Work Plan including the Sampling and Analysis Plan (SAP) (which includes this QAPP and a QASP), and the Health and Safety Plan (HASP).
- Sample Collection Records (logbooks, field notes, data collection sheets, COC records, custody seals, sample tags, phone conversation records, airbills, and corrective action reports).
- Project Data Assessment Records (field sampling audit checklists, Performance Evaluation [PE] samples results, data validation reports, phone conversation records, and corrective action reports).

Logbooks are issued for all field and data collection projects and assignments. All logbooks are currently tracked by the PTL. The logbooks become part of the site file when the project is closed out and are stored with the completed site files.

Logbooks may be assigned to each piece of equipment such as air monitoring instruments and field screening instruments for recording calibration information and are treated similar to field logbooks. The START-3 Project Team Leader will manage all calibration records.

The QAO will maintain an audit filing system with the contents organized into categories that are event-specific (i.e., logbook) and task-specific (i.e., administrative, health and safety, and field audits). Each file should contain items as they pertain to a specific audit event, including dated checklists that were used to execute the audit; a copy of the audit report; verification and acknowledgment of corrective action, if any; and the QAO audit closure statement.

All electronic files of documentation are stored on a secure server and backed up as outlined in Weston's QMP.

### A5.1 Data Handling Records

Data handling records document protocols used in data reduction, verification, and validation. Data verification ensures the accuracy of the data transcription and calculation, if necessary, by checking a set of computer calculations manually. Data validation ensures that QC criteria have been met and data are appropriately qualified. Data validation reports will be available in hard copy and electronically in PDF format.

### A5.2 Field Records/Data Reporting Archiving and Retrieval

Documents and records generated as part of this project will be maintained by START-3 in document archives for the remaining period of the START-3 contract. At the termination of the START-3 contract, WESTON will transfer the document files to the EPA archives as directed by EPA Region 6.

**Table A-1**
**Key Personnel and Responsibilities**

| ORGANIZATION | NAME (TITLE) | RESPONSIBILITIES |
|---|---|---|
| EPA Region 6 | Warren Zehner and Jon Rinehart<br>Task Order Managers | Primary Contact for the project and responsible for all activities performed for the project, including management of START-3 and other contracts. |
| START-3 | David Bordelon<br>Project Manager | Responsible for all activities performed by START-3 including coordinating project activities with the START-3 Project Team Leader (PTL), preparing reviewing reports and correspondence submitted to EPA, and attending project meetings. |
| | Robert Sherman<br>Project Team Leader | Responsible for directing activities performed by START-3 and assumes total control over project activities. Specific responsibilities include communicating with the EPA, coordinating activities with appropriate support personnel, implementing health and safety criteria, preparing and reviewing reports and correspondence submitted to EPA, and attending project meetings. |
| | Jan Cristner P.E.<br>Quality Assurance Officer | Responsible for reviewing project plans, submittals, and documents produced by START-3. Specifically, she will ensure START-3 submittals, plans, and documents comply with industry and START-3 standards; conduct audits; and prepare corrective action memorandums. The QAO is responsible for making sure project personnel have initial QAPP training and follow-up training as need. |
| | Bob Schoenfelder<br>Project Health Physicist | Responsible for development and implementation of QAPP and assurance that all data generated are of known quality to support ordered decisions. |

## Table A-2
## Data Quality Objectives

| | |
|---|---|
| **STEP 1. STATE THE PROBLEM** | |
| Historical underground mining operations contributed waste (uranium and other metals/radionuclides) to the surface in the area of the Section 35and 36 (Cliffside) Mines. | |
| **STEP 2. IDENTIFY THE DECISION** | |
| Is the Total Effective Dose Equivalent (TEDE) greater than 12 mRem/yr for people living or working on the site? | |
| IDENTIFY THE ALTERNATIVE ACTIONS THAT MAY BE TAKEN BASED ON THE DECISIONS. | • If the TEDE is greater than 12 mrem/yr within an area on the site, a removal action will be implemented.<br>• If the TEDE is less than 12 mrem/yr but some small areas of elevated radioactivity are present, a removal action may be conducted to reduce risk.<br>• If the TEDE is less than 12 mrem/yr and no areas of elevated radioactivity are present, a No Further Action Required decision will be applied. |
| **STEP 3. IDENTIFY INPUTS TO THE DECISION** | |
| IDENTIFY THE INFORMATIONAL INPUTS NEEDED TO RESOLVE A DECISION. | • Calculate the TEDE on the site using the site specific Protocol (Protocol) provided as an attachment to the QASP.<br>• Identify the background TEDE. |
| IDENTIFY THE SOURCES FOR EACH INFORMATIONAL INPUT AND LIST THE INPUTS THAT ARE OBTAINED THROUGH ENVIRONMENTAL MEASUREMENTS. | • Measure gamma radiation directly above the ground surface according to procedures outlined in the Protocol.<br>• Collect soil samples and measure the radionuclide activity (in picoCuries per gram).<br>• Determine the projected land use for the site. |
| BASIS FOR THE CONTAMINANT-SPECIFIC ACTION LEVELS. | The TEDE of 12 mRem/yr is from an increased cancer risk as stated in OSWER 9200-4-18. |
| IDENTIFY POTENTIAL SAMPLING TECHNIQUES AND APPROPRIATE ANALYTICAL METHODS. | • Dynamic and stationary gamma surveys as described in the project QASP.<br>• Collecting surface and subsurface soil samples as described in the project QASP. The samples will be analyzed by gamma spectroscopy as described in the project QASP.. |
| **STEP 4. DEFINE THE BOUNDARIES OF THE STUDY** | |
| DEFINE THE DOMAIN OR GEOGRAPHIC AREA WITHIN WHICH ALL DECISIONS MUST APPLY. | The Section 35 and 36 (Cliffside) Mines as well as areas down-gradient in Section 2. |
| SPECIFY THE CHARACTERISTICS THAT DEFINE THE POPULATION OF INTEREST. | The area was affected by uranium mining activities at the Section 35 and 36 (Cliffside) Mines. Populations of interest are ranchers, hikers, hunters, and other recreational user. |

**Table A-2**
**Data Quality Objectives**
**(Continued)**

| **STEP 4. DEFINE THE BOUNDARIES OF THE STUDY (CONTINUED)** | |
|---|---|
| DEFINE THE SCALE OF DECISION MAKING. | Results of the gamma scanning and soil analytical results will be used to determine areas that require a Non-Time-Critical Removal Action. |
| DETERMINE THE TIME FRAME TO WHICH THE DATA APPLY. | The data will apply until there is a change in regulations regarding radiation exposure or until a removal action alters the TEDE. |
| DETERMINE WHEN TO COLLECT DATA. | Gamma radiation scanning and soil sample collection will take place beginning in July 2015. |
| IDENTIFY PRACTICAL CONSTRAINTS ON DATA COLLECTION. | • Inclement weather.<br>• Access not attainable.<br>• Surface conditions preventing subsurface sample collection. |
| **STEP 5. DEVELOP A DECISION RULE** | |
| SPECIFY THE PARAMETER THAT CHARACTERIZES THE POPULATION OF INTEREST. | The measured gamma radiation readings and soil sample analytical results at each location will be compared to the site-specific action levels. |
| SPECIFY THE ACTION LEVEL FOR THE DECISION. | • The Action Level for TEDE is 12 mRem/yr.<br>• A DCGL will be calculated to determine a specific soil action level. |
| DEVELOP A DECISION RULE. | If the TEDE in an area exceeds 12 mrem/yr or if the DCGL is exceeded, that area will be eligible for a removal action. |
| **STEP 6. SPECIFY LIMITS ON DECISION ERRORS** | |
| DETERMINE THE POSSIBLE RANGE OF THE PARAMETER OF INTEREST. | Activity and exposure rates can range from background concentrations to more than the DCGLs. Readings are not expected to be greater than 100 mR/hr or 1,000,000 counts per minute. |

## Table A-2
## Data Quality Objectives
## (Continued)

| STEP 6. SPECIFY LIMITS ON DECISION ERRORS (CONTINUED) | |
|---|---|
| DEFINE BOTH TYPES OF DECISION ERRORS AND IDENTIFY THE POTENTIAL CONSEQUENCES OF EACH. | Type I Error: Deciding that the specified area represented by the field reading or sample does not exceed the site-specific action level when, in truth, the concentration of the contaminant exceeds its site-specific action level. The consequence of this decision error is that contaminated soil or building materials will remain in place, possibly endangering human health and the environment. This decision error is more severe.<br>Type II Error: Deciding that the specified area represented by the field reading or sample does exceed the site-specific action level when, in truth, it does not. The consequences of this decision error are that remediation of the specified area will continue and unnecessary costs will be incurred. |
| ESTABLISH THE TRUE STATE OF NATURE FOR EACH DECISION RULE. | The true state of nature when the soils are decided to be below the site-specific action levels when in fact, they are not below the specified assessment levels, is that the area does need remedial action.<br>The true state of nature when the soils are decided to be above the site-specific action levels when in fact, they are not above the site specific-action level, is that the area does not need remedial action. |
| DEFINE THE TRUE STATE OF NATURE FOR THE MORE SEVERE DECISION ERROR AS THE BASELINE CONDITION OR THE NULL HYPOTHESIS ($H_o$) AND DEFINE THE TRUE STATE FOR THE LESS SEVERE DECISION ERROR AS THE ALTERNATIVE HYPOTHESIS ($H_a$). | $H_o$: The material represented by the field reading or sample of the specified area is above the site-specific action level.<br>$H_a$: The material represented by the field reading or sample of the specified area is below the site-specific action level. |
| ASSIGN THE TERMS "FALSE POSITIVE" AND "FALSE NEGATIVE" TO THE PROPER DECISION ERRORS. | • False Positive Error = Type I<br>• False Negative Error = Type II |
| ASSIGN PROBABILITY VALUES TO POINTS ABOVE AND BELOW THE ACTION LEVEL THAT REFLECT THE ACCEPTABLE PROBABILITY FOR THE OCCURRENCES OF DECISION ERRORS. | To be assigned based on discussions with EPA Task Order Manager(s). |

## Table A-2
## Data Quality Objectives
## (Continued)

| **STEP 7. OPTIMIZE THE DESIGN** | |
|---|---|
| REVIEW THE DQOs. | Due to insufficient historical data, determination of the standard deviation was not possible. Therefore, sample size calculation using the traditional statistical formula may not be the optimal design. To select the optimal sampling program that satisfies the DQOs and is the most resource effective, other elements were considered. |
| **DEVELOP GENERAL SAMPLING AND ANALYSIS DESIGN.**<br>• Gamma screening will be conducted using 2x2 NaI detectors in systematic patterns to screen.<br>• Background soil samples will be collected from an undisturbed areas defined by the TOM and Weston's CHP.<br>• Analytical testing will be conducted in a field laboratory using an MCA to measure radionuclide activity.<br>• 10% of samples analyzed in the field laboratory will be submitted to a commercial laboratory for confirmation analysis.<br>• Surface and subsurface soil samples will be collected from both contaminated and uncontaminated areas. | |

# B DATA GENERATION AND ACQUISITION

Section B addresses the activities performed to acquire data. The subsections of this part discuss sampling design, sampling methodology, sampling documentation, analytical testing, quality control, and data management.

## B1 SAMPLING PROCESS DESIGN

This section of the QAPP describes the sampling system in terms of what media will be sampled, where the samples and the number of samples will be taken, and sampling design rationale. The QASP provides specific methodologies and instruction to the field tams regarding sample collection and analysis. The QASP is provided as Appendix B to the Sampling and Analysis Plan (SAP). Any modifications to the project QASP and the reason for the modification will be documented in writing to the EPA TOM.

## B2 NONDIRECT MEASUREMENTS

Data from nondirect measurements as described in *Guidance from Quality Assurance Project Plans, EPA QA/G-5* (EPA, 2002a), include, but are not limited to existing sampling and analytical data and information from published literature. The site background portion of the Task Order Work Plan summarizes this existing information that was used to develop the current project plan. These include an Assessment completed by Rio Algom, a potentially responsible party, and by the EPA Airborne Spectral Photometric Environmental Collection Technology (ASPECT) airplane. These studies identified areas of concern, including down gradient areas potentially impacted by surface water runoff. Based on the findings of these assessments, the current project EE/CA activities were designed.

## B3 DIRECT READING INSTRUMENTS

Gamma radiation data will be collected from direct-reading instruments using a 2x2 sodium iodide (NaI) detector. START-3 will perform calibration checks using radioactive check sources on the instruments at the beginning of the day and at the end of the day. Instruments that do not

measure within the specifications established by the Project Health Physicist will be removed from service until they can be repaired.

## B4 SAMPLING METHODS

This section addresses the field sampling methods to be followed. The project QASP discusses the types of samples to be collected. START-3 will use dedicated and non-dedicated sampling equipment to collect field samples. Dedicated equipment will be disposed after sampling. All non-dedicated equipment involved in field sampling activities will be decontaminated prior to and subsequent to sampling. Decontamination of sampling equipment will be kept to a minimum in the field and, wherever possible, dedicated sampling equipment will be used. Decontamination will be accomplished using procedures detailed in the project SAP and HASP.

Surface soil samples will be collected using dedicated disposable plastic scoops, and subsurface soils will be collected using a Geoprobe® or, alternately, using slam bar sampling methods. Soil samples that are collected via Geoprobe® and slam bar will come in contact with a disposable acetate sleeve.

### B4.1 Sample Containers

The soil samples collected as part of this project will be placed in certified clean glassware and/or Marinelli jars. Each box of certified clean glassware includes a certificate documenting cleanliness. The certificates for each bottle lot will be collected and maintained in the site file. Sample labels displaying the sample number will be affixed to sample containers. After sampling, each container will be sealed with a custody seal, and a sample tag will be attached to each container.

### B4.2 Sample Volumes, Container Types, Preservation Requirements, and Hold Times

Approximately one half liter of soil will be required for each analysis. The soil sample will be placed into a resealable plastic bag. The samples will be dried, sieved, milled, and placed into sealed Marinelli jars. Soil samples do not need chemical preservation nor do they need to be put on ice. There are no hold times associated with the soil samples for gamma spectroscopy analysis.

## B5 SAMPLE HANDLING AND CUSTODY

Information regarding field and laboratory sample handling and custody procedures are discussed in the following subsections.

### B5.1 Field Sample Handling and Custody

Sample custody is maintained when a sample is in a secure area or in view of, or under the control of, a particular individual. Personnel responsible for maintaining sample custody will be identified in the project SAP.

Chain-of-custody records will be prepared to accompany samples from the time of collection and throughout the shipping and analytical process. Each individual in possession of the samples will sign and date the sample chain-of-custody document. The field chain-of-custody record will be considered completed upon receipt at the laboratory.

A chain-of-custody record will be maintained from the time the sample is taken to its final deposition. Every transfer of custody must be noted and signed for, and a copy of this record kept in the site file. When samples (or groups of samples) are not under direct control of the individual responsible for them, they must be stored in a locked container sealed with a custody seal. Specific information regarding custody of the samples projected to be collected on the weekend will be noted in the field logbook.

### B5.2 Laboratory Sample Handling and Custody

At the laboratory, the person responsible for receiving the sample cooler will sign and date the chain-of-custody form; verify that custody seals are intact on shipping containers and sample bottles; compare samples received against those listed on the chain-of-custody form and sample tags. The laboratory will maintain internal chain-of-custody documentation and sample receipt documents, and place the samples in the appropriate laboratory storage.

## B6 ANALYTICAL METHODS

Soil samples will be analyzed for radium-226 (Ra-226) using gamma spectroscopy using a Multi-Channel Analyzer (MCA) at the field laboratory. START-3 will place the samples into

sealed jars and wait for a 21 day grown-in period before analyzing. Soil samples custody sealed and stored within a locked building during the grown-in period. The grown-in period will allow the Ra-226 to equilibrate with bismuth-214 (Bi-214). The MCA will analyze Bi-214.

## B7 QUALITY CONTROL REQUIREMENTS

The following subsections identify the typical QC procedures required for field sampling and for the analytical methods described later in this section of the document

### B7.1 Field MCA QC Procedures

START-3 will use the MCA to analyze a blank and two standards at the beginning and end of each day the instrument is utilized. Additionally, every $10^{th}$ sample run will be analyzed twice. If the blank, standards, or duplicates are not within two sigma of the proper value designated within the MCA field operating procedure document, the Health Physicist will be consulted to investigate the deviance. START-3 will cease all MCA analysis until the deviance is corrected and all QA/QC requirements are met.

### B7.2 Offsite Laboratory Analysis

Ten percent of the samples collected and analyzed with the MCA in the field office will be sent to an offsite radiological laboratory for confirmation analysis.

### B7.3 Non-Dedicated Equipment

Whenever possible, dedicated sampling equipment will be used and discarded after a single sample is collected. When non-dedicated equipment is used, it will be decontaminated between samples. Decontamination will be verified by scanning the equipment with a pancake probe radiation detector.

### B7.4 Sample Duplicates

Environmental duplicates are collected to demonstrate the reproducibility of overall sampling and analysis technique and the variability of the sample matrix. The blind field duplicate

analysis is separate from the laboratory duplicate analysis. At a minimum, one blind field duplicate sample pair will be collected per each matrix at a frequency of one per 10 samples.

## B8 BACKGROUND SAMPLES

In order to assess any potential contamination on the site, background samples must be collected. Twenty background samples will be collected to provide statistical significance. The background samples will be collected from an area with similar geology, as close to the site as practical, and at a location that is as undisturbed as possible.

## B9 NON-DIRECT MEASUREMENTS

Previously collected data and other information that will be used to make project decisions will be assessed to determine the limitations of the acquired data. Secondary sources of acquired data and information include, but are not limited to the following:

- Historical data (e.g., from organization's/facility's corporate records and/or federal/state or local records pertaining to previous monitoring events, site assessments, investigations, etc.).
- Background information/data from organization's/facility's corporate records and/or federal/state/local records pertaining to site-specific industrial processes, process by-products, past and current chemical uses, raw material and finished product testing, waste testing and disposal practices, and potential chemical breakdown products.
- Data generated to verify innovative technologies and methods.
- Data generated from computer databases (such as manufacturers' process/product information, waste management or effluent information).
- Environmental indicator data obtained from federal/state/local records.
- Computer models or algorithms.
- Literature files/searches.
- Publications.
- Photographs.
- Topographical maps.

If known, all QC procedures, checks and samples that were analyzed with the data set will be listed. The method and/or laboratory-specific QC acceptance criteria used for data generation

and whether the data was verified and validated will be noted. If data were verified and/or validated, then the criteria and procedures used will be listed.

## B10 DATA MANAGEMENT

Data management is the system by which data is reduced, reviewed, validated, reported, distributed, and archived. This system is designed to meet the QA objectives for this project. As part of the START-3 data management requirements, all documents will be completed legibly in ink as well as by entry into field logbooks, Response Manager, or SCRIBE. Response Manager is the Enterprise Data Collection System designed to provide near real-time access to data normally collected in logbooks. Response Manager provides a standard data collection interface for modules of data normally collected by START-3 field personnel while on-site. These modules fall into two basic categories for response and removal. The modules include Emergency Response, Reconnaissance, Facility Assessment, Shipping, Container, Materials, Calls, Household Hazardous Waste (HHW), and General/Site-Specific Data. The system provides users with a standard template for laptop/desktop/tablet PCs that will synchronize to the secure web interface using merge replication technology to provide access to collected data via the RRC-EDMS EPA Web Hub. Response Manager also includes an integrated GPS unit with the secure PDA application, and the coordinates collected in Response Manager are automatically mapped on the RRC-EDMS interactive mapping site. GIS personnel can access this data to provide comprehensive site maps for decision making support.

Response Manager also includes an analytical module that is designed to give SCRIBE users the ability to synchronize the SCRIBE field data to the RRC-EDMS Web Hub. This allows analytical data managers and data validators access to data to perform reviews from anywhere with an available Internet connection. The analytical module is designed to take the analytical data management functionality of the EPA SCRIBE software and make it available for multiple users to access on one site. Response Manager also supports EPA standards such as ANSETS and SEDD and will allow users to connect to the database using the SCRIBE desktop interface, thus providing normal SCRIBE desktop-like functionality for multiple users.

All electronic files are stored on a secure server and backed up regularly.

## B10.1 Field Documentation

The following field documentation will be maintained as described below.

### Field Logbook

The field logbook is a descriptive notebook detailing site activities and observations so that an accurate, factual account of field procedures may be reconstructed. Each individual will sign any entry he/she makes. Entries will include, at a minimum, the following:

- Site name and project number.
- Names of on-site personnel.
- Dates and times of all entries.
- Description of all site activities, including site entry and exit times.
- Noteworthy events and discussions.
- Weather conditions.
- Site observations.
- Identification and description of samples and locations.
- Global Positioning System (GPS) Latitude and Longitude coordinates for sample locations
- Subcontractor information and names of on-site personnel.
- Dates and times of sample collections and chain of custody information.
- Records of photographs.
- Site sketches.

### Sample Labels

Sample labels will be securely affixed to the sample container. The labels will clearly identify the particular sample and will include the following information:

- Site name and project number.
- Date and time the sample was collected.
- Sampling location.
- Analysis requested.
- Sampling location.

A chain of custody will be maintained from the time of sample collection until final deposition. Every transfer of custody will be noted and signed for and a copy each record will be kept by the signing individual.

### Custody Seal

Custody seals demonstrate that a sample container has not been tampered with or opened. The individual who has custody of the samples will sign and date the seal and affix it to the container in such a manner that it cannot be opened without breaking the seal.

### Photographic Documentation

START-3 team members will take photographs to document site conditions and activities as work progresses. Initial conditions should be well documented by photographing features that define the site-related contamination or special working conditions. Representative photographs should be taken of each type of site activity. The photographs should show typical operations and operating conditions as well as special situations and conditions that may arise during site activities. Site final conditions should also be documented as a record of how the site appeared at completion of the work.

All photographs should be taken with a camera capable of recording the date on the image. Each photograph will be recorded within Response Manager with the location of the photographer, direction the photograph was taken, the subject of the photograph, and its significance (i.e., why the picture was taken). Where appropriate, the photograph location, direction, and subject will also be shown on a site sketch and recorded within Response Manager.

## B10.2 Data Storage/Retrieval

Storage and retrieval procedures for electronic and hardcopy data generated for the project will be approved by the START-3 Quality Assurance Officer (QAO). Data shall be reviewed by the START-3 QAO or his/her designee before inclusion in any report, or before any critical site decisions are made. Project documents will be maintained by START-3 in the site file and may be retrieved upon request.

# C ASSESSMENT AND OVERSIGHT

Part C provides guidance to assess the effectiveness of the project's implementation of QA/QC activities. This assessment will help verify the QAPP is being implemented as prescribed.

## C1 ASSESSMENT AND RESPONSE ACTIONS

The following subsections describe the assessments and corresponding response actions for sampling activities.

### C1.1 Audits and Surveillances

Audits shall be conducted periodically to assess conformance to the Work Plan and QAPP. Any changes and deviations from the QAPP during field activities will be documented in a memorandum addressed to the EPA TOM. Corrective action procedures will be implemented when deviations from the QAPP that could potentially impact data quality and/or usability are noted by project personnel outside the formal assessment process. Any such incidents will be documented and resolved using the procedures and personnel that were detailed for planned assessments.

Audits are of two specific types: (1) project audits and (2) field audits. These audits will be performed on an as-needed basis.

#### C1.1.1 Project Audits

Project audits will be conducted to evaluate the quality, completeness, and timeliness of individual project task assignments. All nonconformance issues will be brought to the attention of the Project Manager. These audits are conducted by the QAO or his/her trained representative. The audit reports and corrective actions are sent to the START-3 Project Manager and Project Team Leader.

### C1.1.2 Field Audits

Field audits will be conducted to ensure START-3 field personnel are adhering to proper sampling, administrative, and health and safety SOPs. Field audit considerations should include sample documentation; sampling plan adherence; equipment operation, maintenance, and calibration; proper handling of standards, calibration gases, and preservatives; sampling techniques; decontamination; data management and review; sample custody; packing and shipment procedures; and health and safety practices. Field audits will be conducted by the QAO or PTL on a random basis and in response to reports or findings of poor performance or noncompliance with the QAPP, SOPs, or sound engineering practices. The associated reports and corrective actions are sent to the START-3 Project Manager and EPA TOM, as appropriate.

## C1.2 Corrective Actions

Corrective actions are required whenever a deficiency or inadequacy in the field and/or in the laboratory operations is identified. Corrective action may be required due to malfunctioning equipment systems and instruments, or equipment systems and instruments that fail calibration or generate data that exceed stated acceptance limits. Nonconformances to SOPs and site-specific QAPPs will also result in corrective action if they have a negative impact on data quality, usability, or established detection limits. It is the responsibility of the START-3 Project Manager to assure that corrective action be initiated as soon as possible. Nonconformance and corrective actions will be documented in the site file memorandum with correspondence to the QAO and the appropriate START-3 personnel if equipment malfunction is observed.

## C2 REPORTS TO MANAGEMENT

In order to ensure that corporate and project management is periodically updated on the project status and results of QA assessments, QA Management reports will be prepared by the START-3 QAO, as needed. Project management shall be updated with any modifications to the QAPP.

## C3 FINAL REPORT

The final report will be prepared to summarize the project RSA and EE/CA project activities and objectives. The final report will include the following information:

- Project quality objectives, narrative and time line of project activities.
- Summary of field activities conducted.
- Data summary including tables, charts, graphs.
- Data gaps, assessment results, engineering evaluation and cost analysis.

# D DATA VALIDATION AND USABILITY

Analytical data will be generated by the START-3 field laboratory and the offsite commercial analytical laboratory. START-3 will validate the radioanalytical data of both the field laboratory and the offsite commercial laboratory by having each data set reviewed by a professional health physicist. A summary of the data validation and findings will be presented in the Site Summary Report as part of the final report. START-3 will evaluate the following to verify that the radioanalytical data are within acceptable QA/QC tolerances:

- The completeness of the Laboratory Reports, verifying that all required components of the report are present and that the samples indicated on the accompanying chain-of-custody are addressed in the report.
- The results of laboratory blank analyses.
- Compound identification and quantification accuracy relative to expected isotopic ratios for uranium and its decay products.
- Laboratory precision, through review of the results for the blanks, standards, and blind field duplicates.

Variances from the QA/QC objectives will be addressed as part of the Data Validation Summary Reports.